PROGRIS RIPORT 20

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`itehu:~kotani/glast.itehu/txt/010817.kotani2.riport20`
`http://lheawww.gsfc.nasa.gov/users/kotani/glast/010817.kotani2.riport20.ps`
`http://lheawww.gsfc.nasa.gov/users/kotani/glast/010817.kotani2.riport20.pdf`

1 Have Done

- Developed and released a BGD filter set for balloon data.
- Applied the filter set to the balloon flight data.

2 BGD filter set

A BGD filter set (`appfilter ver. 1.0`) for BFEM data is released. It is available at `http://lheawww.gsfc.nasa.gov/users/kotani/glast/bgdfilter/appfilter.1.0.tar.gz`. The analysis of BFEM data with the package is described in `http://lheawww.gsfc.nasa.gov/users/kotani/glast/bgdfilter`. The package also includes (an imperfect copy of) the AO filter set for PDR data produced with `pdrApp`, so you may use the package for PDR data.

Can't access to the web site? It's maybe due to the Code-Red-II-worm panic. Try `ftp://lheaftp.gsfc.nasa.gov/pub/kotani/bgdfilter/appfilter.1.0.tar.gz`, which is accessible only day time (EDT), though.

The filter set in appfilter ver. 1.0 is shown in Table 1. Since the configuration of the ACD tiles of the BFEM is different from that of the GLAST, a new veto code for the BFEM is necessary. A temporal simple veto logic, which cuts events with any ACD hits, is adopted for the current version. This filter is not so intellectual and to be educated. The reconstruction information is not used in the current filter set and to be used. You needs the information if you want a filter based on DOCA.

It should be noted that `RootWriter v5r6p1` doesn't write some Cal NTuples to files. If you apply appfilter ver. 1.0 to a file missing the Cal NTuples, you will encounter errors due to missing NTuples.

3 Filtering the BFEM Flight Data

`appfilter ver 1.0` is applied to the BFEM flight data, so called Run 53, 54, and 55. A preliminary result is shown in Table 2.

Hmm... Something strange. It is obvious that the BFEM-ACD filter doesn't work at all. Why is the number of lit tile so small? Is the threshold correct? It must be checked. The CAL-info filter doesn't seem working, too. I'm waiting for the Cal Team to release a new calibration data. The new data are necessary to make `bfemApp` to output meaningful Cal Ntuples. The ratio of remaining events changes with time. Is this change consistent with that of source? It must be studied.

The numbers in Table 2 may seem poor, but they are being improved.

4 To Do

- Improve the BFEM-ACD filter. Is the threshold correct?
- Compare the results with the simulation data.
- Develop a BFEM filter set optimized for the balloon flight set up.
- Don't forget about the albedo particle rate study. The deadline is 2001/08/26.

References

[1] Kotani, 2000/07/25, Riport 18, http://lheawww.gsfc.nasa.gov/users/kotani/glast/010725.kotani2.riport18.ps

Table 1: BGD filter set for BFEM (appfilter ver. 1.0)

These definitions/codes are under development and subject to change. `filter()` returns an array of Aux_CutFlag with a size equal to the number of the events. If a filter finds a BGD event which doesn't meet the condition below, the corresponding bit of Aux_CutFlag is set to be 1. If you apply appfilter ver. 1.0 for PDR data, see Table 5 in Riport 18 for the definition of the filter set.

<table>
<tr><th>Name</th><th>Aux_CutFlag</th><th>Code/Definition</th></tr>
<tr><td>L1T</td><td>2^0</td><td>Omitted</td></tr>
<tr><td>L2T</td><td>2^1</td><td>Omitted</td></tr>
<tr><td>L3T</td><td>2^2</td><td>Omitted</td></tr>
<tr><td>BFEM ACD</td><td>2^{14}</td><td>ACD_TileCount = 0</td></tr>
<tr><td>New DOCA</td><td>2^{16}</td><td>Omitted</td></tr>
<tr><td>Hit Pattern</td><td>2^{17}</td><td>REC_Surplus_Hit_Ratio > 0.3 || (Cal_Energy_Deposit $> 10^3$ && TKR_First_XHit > 13) || Cal_Energy_Deposit $> 5 \times 10^3$</td></tr>
<tr><td>CAL Info</td><td>2^{18}</td><td>{Cal_Xtal_Ratio>0.25 || Cal_No_Xtals < 1}
&& {(Cal_Energy_Deposit $< 10^3$ && Cal_Fit_errNrm $< 10.$) || Cal_Fit_errNrm $< 4.$ || Cal_No_Xtals <1}</td></tr>
<tr><td>Track Quality
(Jose's filter)</td><td>2^{19}</td><td>TKR_qual $> 10.$ && TKR_Gamma_zdir $\neq 0.$
&& {(Cal_Corr_Energy > 0 && TKR_t_angle $<$ kalfit && $\vert$TKR_Fit_Kink$\vert <$ kalfit)
|| (Cal_Corr_Energy ≤ 0 && TKR_t_angle $- \frac{35}{\vert\text{TKR\_Gamma\_zdir}\vert} < 0$ && $\vert$TKR_Fit_Kink$\vert - \frac{35}{\vert\text{TKR_Gamma_zdir}\vert} < 0$)}
$\text{kalfit} = 3.5 \times 10^{-3} \times \left(\frac{3.0}{\text{Corr\_Energy}\,\vert\text{TKR\_Gamma\_zdir}\vert} + \frac{2.18}{\sqrt{\text{Corr\_Energy}}\,\vert\text{TKR\_Gamma\_zdir}\vert}\right)$</td></tr>
<tr><td>S/C Ind. Ev. Cuts 0</td><td>2^{20}</td><td>{ Cal_Energy_Deposit $= 0$ ||
(Cal_eLayer7/Cal_Energy_Deposit<0.08 || Cal_eLayer0/Cal_Energy_Deposit > 0.25
|| Cal_Energy_Deposit > 350 || Cal_No_Xtals < 1)}</td></tr>
<tr><td>2</td><td></td><td>&& {Cal_No_Xtals_Trunc$<20.$ || Cal_Energy_Deposit$> 75 \times 10^3$ || TKR_First_XHit<12}</td></tr>
<tr><td>3</td><td></td><td>&& {Cal_Z$> -30.$ || Cal_No_Xtals<1}</td></tr>
</table>

Table 2: Filtered BFEM flight data
It should be noted that this is preliminary. The number and ratio of remaining BGD events are shown. The "independent" column shows the effect of each filter applied solely, and the "accumulative" column shows the effect of all the filters applied in turn. Run 53 was taken on ground and run 54 and 55 was in flight.

	Run 53			
	Independent		Accumulative	
L1T	1	30530	1	30530
BFEM ACD	$(9.960 \pm 0.057) \times 10^{-1}$	30409	$(9.960 \pm 0.057) \times 10^{-1}$	30409
Hit Pattern	$(2.511 \pm 0.029) \times 10^{-1}$	7667	$(2.498 \pm 0.029) \times 10^{-1}$	7627
CAL Info	$(9.999 \pm 0.057) \times 10^{-1}$	30527	$(2.497 \pm 0.029) \times 10^{-1}$	7624
Track Quality	$(7.652 \pm 0.050) \times 10^{-1}$	23362	$(1.718 \pm 0.024) \times 10^{-1}$	5244
S/C Induced Event	$(1.800 \pm 0.024) \times 10^{-1}$	5495	$(5.56 \pm 0.13) \times 10^{-2}$	1697
	Run 54			
	Independent		Accumulative	
L1T	1	109867	1	109867
BFEM ACD	$(9.576 \pm 0.030) \times 10^{-1}$	105209	$(9.576 \pm 0.030) \times 10^{-1}$	105209
Hit Pattern	$(3.294 \pm 0.017) \times 10^{-1}$	36193	$(3.167 \pm 0.017) \times 10^{-1}$	34793
CAL Info	$(9.990 \pm 0.030) \times 10^{-1}$	109754	$(3.160 \pm 0.017) \times 10^{-1}$	34722
Track Quality	$(5.411 \pm 0.022) \times 10^{-1}$	59450	$(1.511 \pm 0.012) \times 10^{-1}$	16604
S/C Induced Event	$(2.282 \pm 0.014) \times 10^{-1}$	25067	$(6.505 \pm 0.077) \times 10^{-2}$	7147
	Run 55			
	Independent		Accumulative	
L1T	1	104819	1	104819
BFEM ACD	$(9.237 \pm 0.030) \times 10^{-1}$	96826	$(9.237 \pm 0.030) \times 10^{-1}$	96826
Hit Pattern	$(3.173 \pm 0.017) \times 10^{-1}$	33260	$(2.956 \pm 0.017) \times 10^{-1}$	30989
CAL Info	1	104819	$(2.956 \pm 0.017) \times 10^{-1}$	30989
Track Quality	$(5.769 \pm 0.023) \times 10^{-1}$	60473	$(1.564 \pm 0.012) \times 10^{-1}$	16391
S/C Induced Event	1	104819	$(1.564 \pm 0.012) \times 10^{-1}$	16391